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(Reaffirmed 2005)
Edition 1.1
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Indian Standard

SPECIFICATION FOR CAST OR FORGED STEEL CHECK VALVES (FLANGED OR BUTT WELDING ENDS) FOR PETROLEUM, PETROCHEMICALS, CHEMICALS AND ALLIED INDUSTRIES

(Incorporating Amendment No. 1)

Industrial Valves Sectional Committee, EDC 81 [Ref : Doc : EDC 81 (3798)]

1. Scope — Specifies the requirements for cast or forged steel check valves with flanged or butt-welding ends.

1.1 It covers the valves in nominal sizes from 50 mm to 600 mm as specified in IS : 9520-1980 'Nominal sizes for valves' and class designations:

150, 300, 600, 900, 1 500 and 2 500

1.2 For each class and type, the range of sizes covered by this standard is shown in Table 1.

TABLE 1 DIMENSIONS OF CHECK VALVES

(*Clause* 5.1)

All dimensions in millimetres.

Nominal Size	Class 150	Class 300	Class 600	Class 900	Class 1 500	Class 2 500
50	8.7	9.5	11.1	For sizes DN 20 to DN 65, Class 1 500 valves are used	19.0	22.2
65	9.5	11.1	11.9		22.2	25.4
80	10.3	11.9	12.7	19.0	23.8	30.2
100	11.1	12.7	15.9	21.4	28.6	35.7
150	11.9	15.9	19.0	26.2	38.1	48.4
200	12.7	17.5	25.4	31.8	47.5	61.9
250	14.3	19.0	28.6	36.5	57.2	67.5
300	15.9	20.6	31.8	42.1	66.7	86.5
350	16.7	22.2	34.9	46.0	69.8	—
400	17.5	23.8	38.1	52.4	79.4	—
450	18.3	25.4	41.3	57.2	88.9	—
500	19.0	27.0	44.4	63.5	98.4	—
600	20.6	30.2	50.8	73.0	114.3	—

Note — Globe lift check valves are generally not made in sizes above 400 mm.

2. Types — Valves shall be one of the following types:

a) *Swing Type* (for horizontal or vertical flow, Fig. 1).

b) *Lift Type*:

i) Straight pattern (for use with the axis of body end ports horizontal, Fig. 2 and 3).

ii) Straight pattern (for use with the axis of body end ports vertical, Fig. 4).

iii) Angle pattern (for use in applications where the axis of body end ports are at 90°, Fig. 5).

iv) Disc type check valves (vertical pattern, Fig. 6).

Adopted 31 July, 1984

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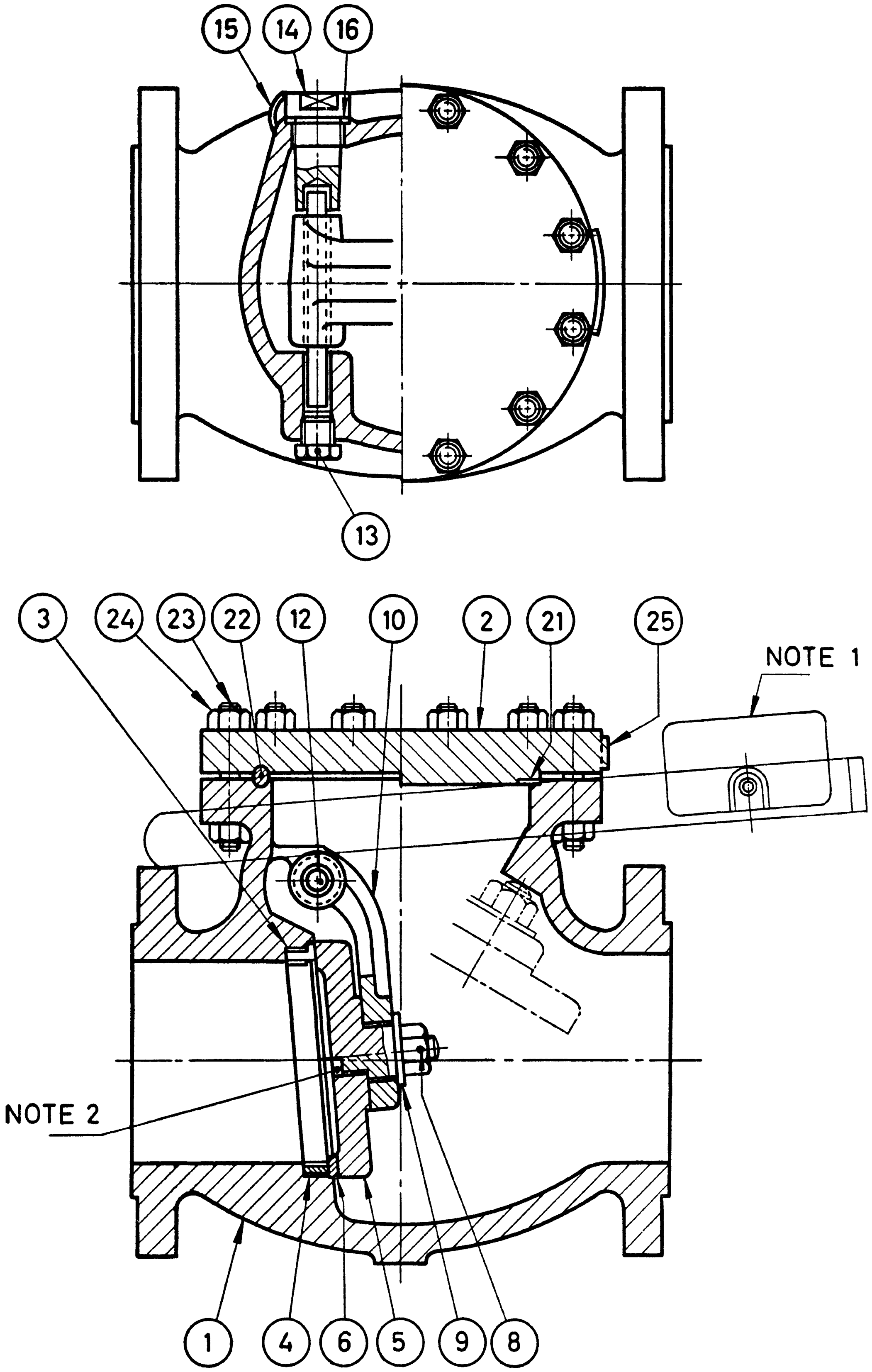
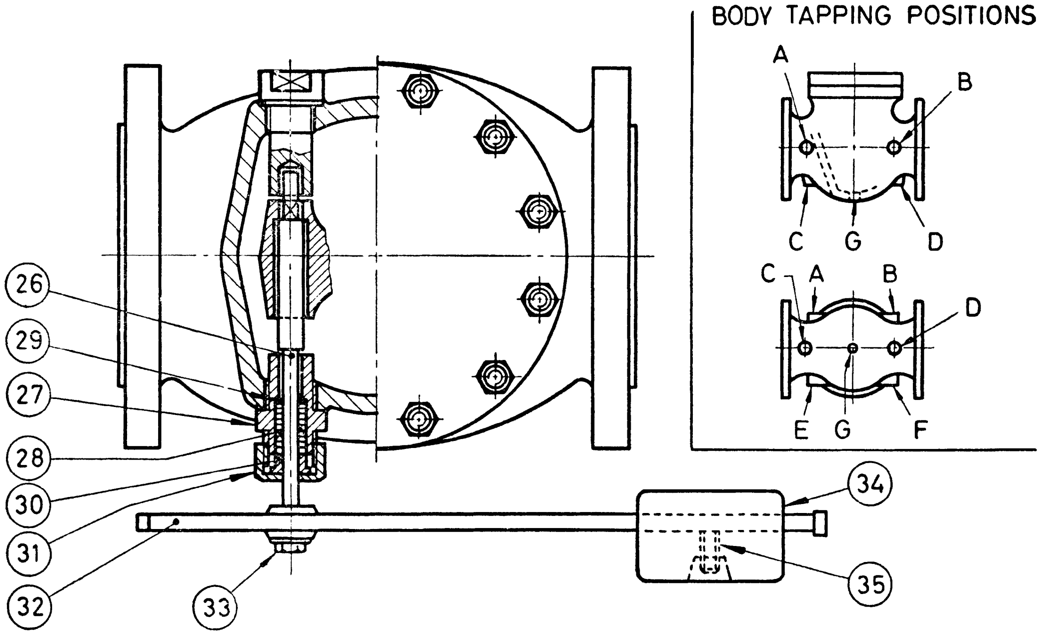
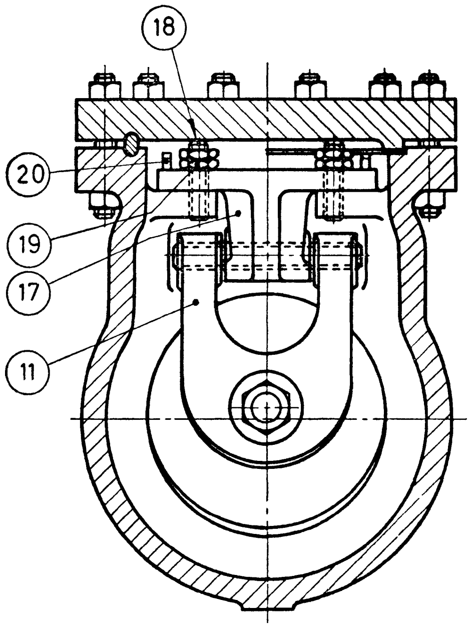


TYPE I

FIG. 1 SWING TYPE CHECK VALVES — *Contd*



TYPICAL DESIGN OF OUTSIDE LEVER AND WEIGHT ATTACHMENT



TYPE II. HINGE ATTACHED TO INTERNAL BODY LUGS

Part Ref	Name of part	
1.	Body	
2.	Cover	
3.	Shoulder seated ring	
4.	Bottom seat d ring	
5.	Disk	
6.	Disk facing ring	
7.	Disk-retaining nut	
8.	Pin for disk-retaining nut	
9.	Disk washer	
10.	Hinge (type (i))	
11.	Hinge (type (ii))	
12.	Hinge pin	
13.	Pipe plug (taper threaded) for hinge pin (type (i) only)	
14.	Hinge pin plug (parallel threaded) (type (i) only)	
15.	Locking device for hinge pin	
16.	Gasket for pipe plug (parallel threaded)	
17.	Bearing bracket (type (ii) only)	
18.	Stud for bracket (type (ii) only)	
19.	Lock nuts for bracket (type (ii) only)	
20.	Dowel pin for bracket (type ii) only)	
21.	Cover gasket	
22.	Ring joint	
23.	Stud bolts	
24.	Nuts for stud bolts	
25.	Nameplate	
26.	Extended hinge pin	For outside attachment valves only
27.	Stuffing box	
28.	Packing	
29.	Packing washer	
30.	Gland	
31.	Gland nut	
32.	Lever	
33.	Lever retaining pin	
34.	Weight	
35.	Setscrew	

Note 1 — Chain dotted lines show outside lever and weight to assist disk in closing.

Note 2 — Seal weld.

Note 3 — These sketches are composite for the pumps of showing some typical variations in individual details. A product utilizing any combination of these details (except when such combination may be specifically prohibited in the text) or similar construction will be acceptable provided that it complies with the requirements of this standard in all other respects.

FIG. 1 SWING TYPE CHECK VALVES

Part Ref	Name of Part	Fig. No.
1.	Hinge pin plug	
2.	Cover ring joint	2, 3, 4, 5
3.	Cover stud bolt nut	2, 3, 4, 5
4.	Cover stud bolt	2, 3, 4, 5
5.	Cover gasket	2, 3, 4, 5
6.	Hinge	
7.	Cover	2, 3, 5
8.	Hinge pin	
9.	Body seat ring (shoulder seated)	2, 3, 4, 5
10.	Disk	5
11.	Disk retaining stud	
12.	Disk facing ring	
13.	Body	2, 3, 4, 5
14.	Disk washer	
15.	Disk retaining nut	
16.	Body seat ring (Bottom seated)	2, 3
17.	Ball guide	3
18.	Disk (piston type)	2
19.	Ball	3, 4
20.	Loading spring	3
21.	Disk holder	5
22.	Disk	5
23.	Disk retaining nut	5
24.	Grid	4
25.	Seat ring with guide	4
26.	Grid with guide	4
27.	Disk guide	2, 5
28.	Lever retaining nut	
29.	Lever	
30.	Weight	
31.	Set screw	
32.	Gland nut	
33.	Gland	
34.	Stuffing box	
35.	Packing	
36.	Packing washer	

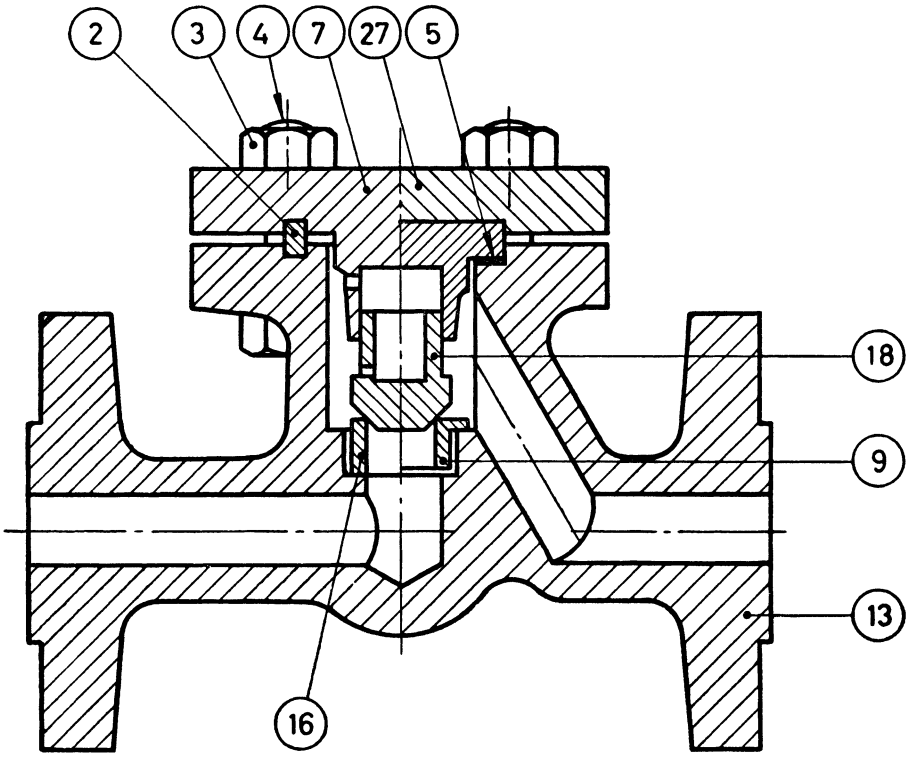


FIG. 2 PISTON TYPE CHECK VALVE

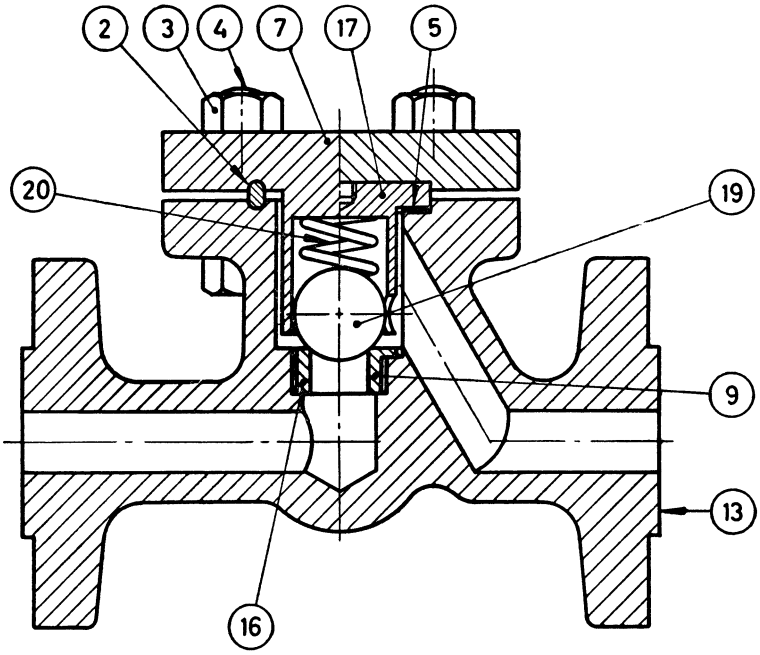


FIG. 3 BALL TYPE CHECK VALVE FOR HORIZONTAL FLOW

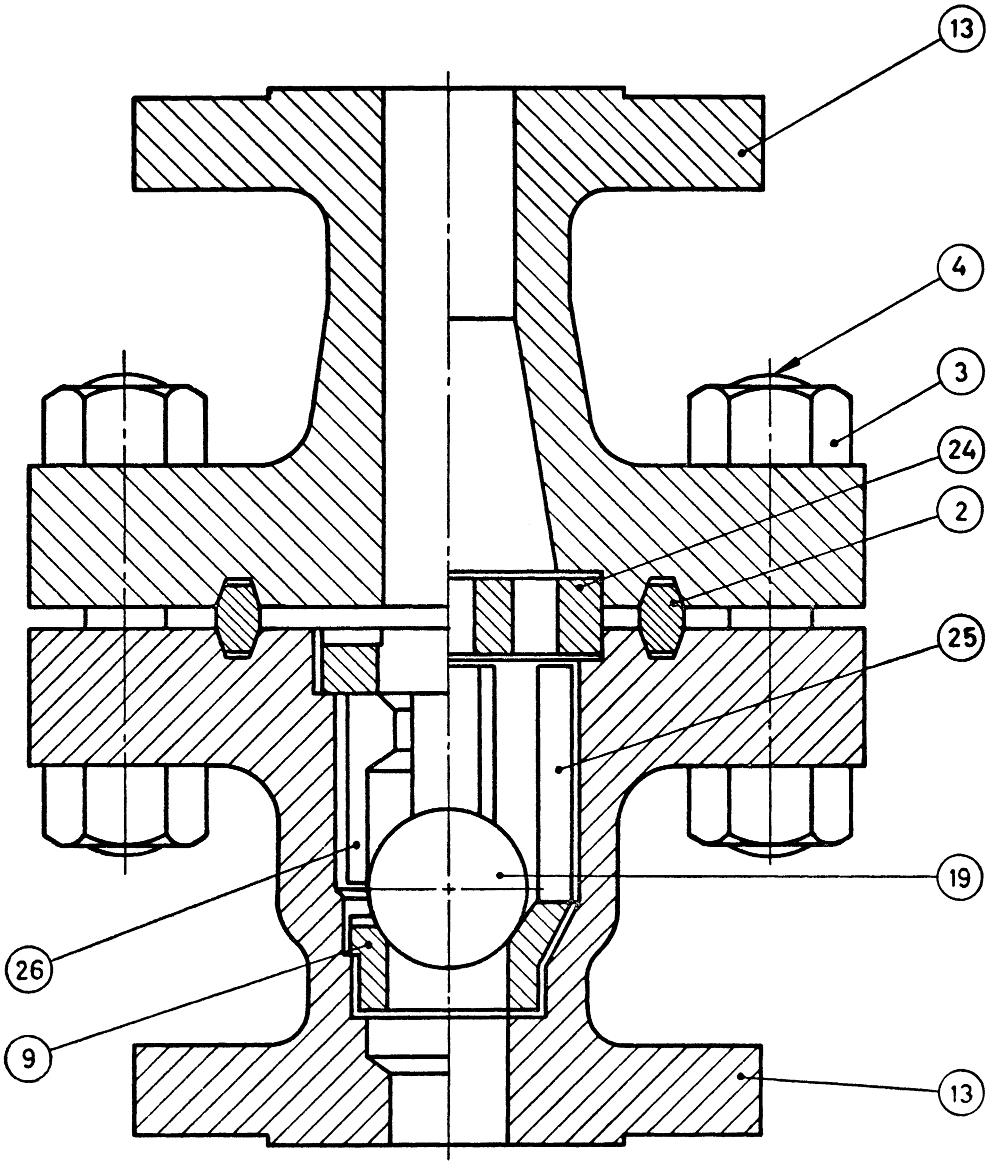


FIG. 4 BALL TYPE CHECK VALVE FOR VERTICAL OR HORIZONTAL FLOW

2.1 When swing check valves are used in vertical lines, the flow must be in an upward direction. For the purpose of this standard any line with a slope (upward or downward) of 5° or less shall be deemed to be horizontal. In the case of angle pattern valves the inlet shall be vertical.

3. Terminology and Definitions — For the purpose of this standard the terminology and definitions given in IS : 4854 (Part 1) 'Glossary of terms for valves and their parts : Part 1 Screw down stop, check and gate valves and their parts', are generally applicable.

4. Pressure/Temperature Ratings — The pressure/temperature ratings applicable to valves covered by this standard shall be in accordance with IS : (Under preparation) 'Steel pipe flanges and flanged fittings' for the particular shell material specified. There is however a temperature restriction on certain trim materials and soft seal ring.

5. Body

5.1 The minimum body thickness at any point shall be not less than the values given in Table 1. Drilling or pinning to the wall of a pressure containing part, for example, the name plate fixing is not permissible where it will reduce the effective thickness below the minimum permitted value.

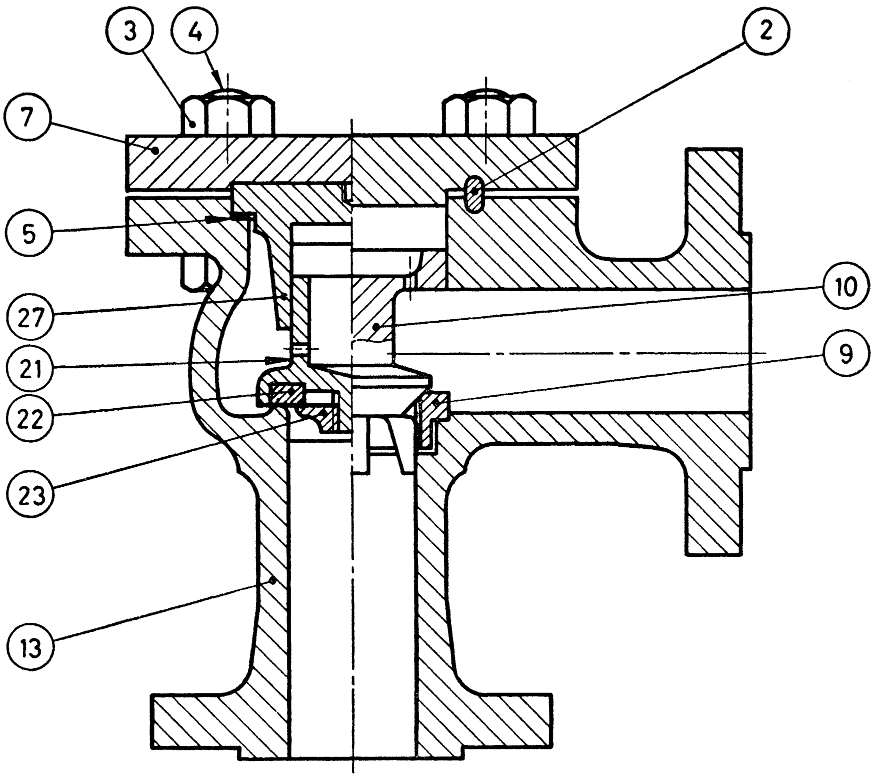


FIG. 5 LIFT TYPE DISK CHECK VALVE (ANGLE PATTERN)

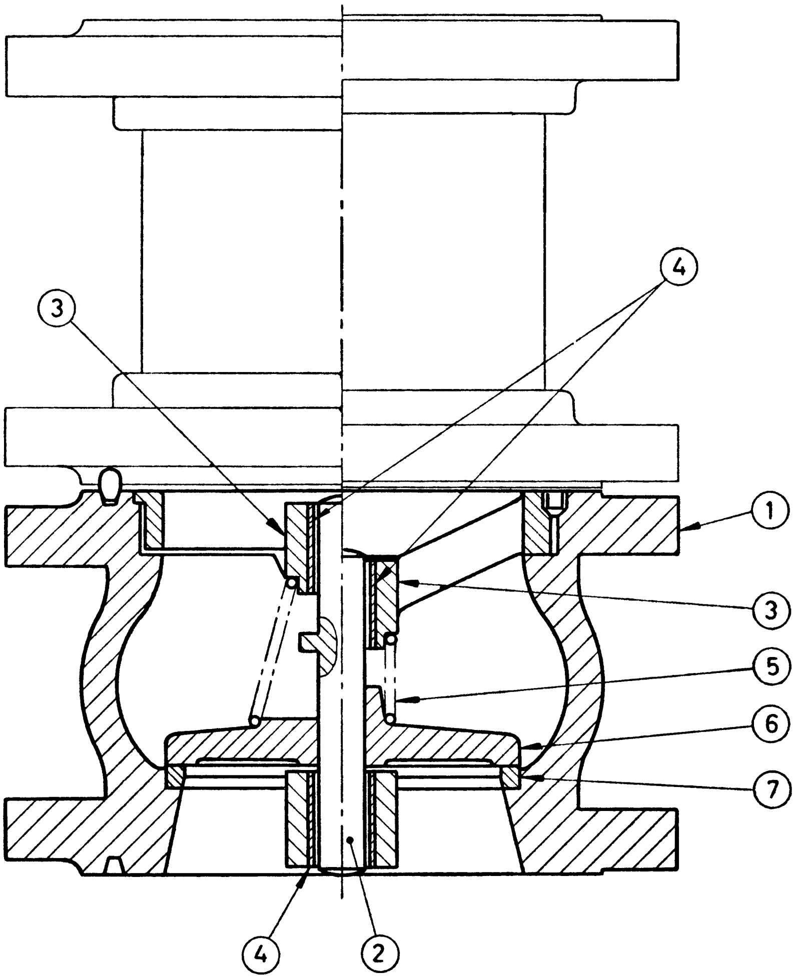
5.2 Face to face and centre to face dimensions for raised face flanged end valves and end to end and centre to end dimensions for butt-welding end and ring joint flanged end valves shall conform to the dimensions specified in IS : 9884-1981 'Dimensions for ferrous valves-face-to-face and end-to-end'.

5.3 End flanges shall be machined, spot face or back faced in accordance with 'Indian Standard specification for steel pipe flanges and flanged fittings (*under preparation*)' for the facing specified in the purchase order. When nothing particular is specified by the purchaser, the flanges shall be supplied drilled and bolt holes shall be 'off centres'.

If any other flange dimensions are required by the purchaser, the same shall be specified in purchase order and shall mutually be agreed to by supplier and purchaser.

5.4 The flanged end valves may have the flanges integral with or welded to the body. End flanges attached by welding shall be butt-welding type and welds, including the qualification of the welding procedure and operator, shall conform to 'Indian Standard specification for butt-welding end (*under preparation*)' or other types of weld subject to agreement between purchaser and manufacturer.

5.5 The design of valve bodies shall provide ample resistance to distortion under the maximum cold working pressure and under the specified pressure at the maximum temperature. The body shall be designed to minimise pressure loss as well as erosive effects.



Ref	Name of Part
1.	Body
2.	Disk spindle
3.	Spindle support cage
4.	Spindle guide bush
5.	Loading spring
6.	Disk
7.	Seat ring

These sketches are composite for the purpose of showing typical variations in individual details and part names. A product utilising any combination of these details (except when such combination may be specifically prohibited in the text) or similar construction will be acceptable provided that it complies with the requirements of this standard in all other aspects.

FIG. 6 DISK TYPE CHECK VALVES

5.6 For butt-welding ends, the minimum inside diameter of the body end ports and other end dimensions shall conform to Fig. 7. Pipe particulars or pipe wall thickness and outside diameter of this pipe shall be specified by the purchaser.

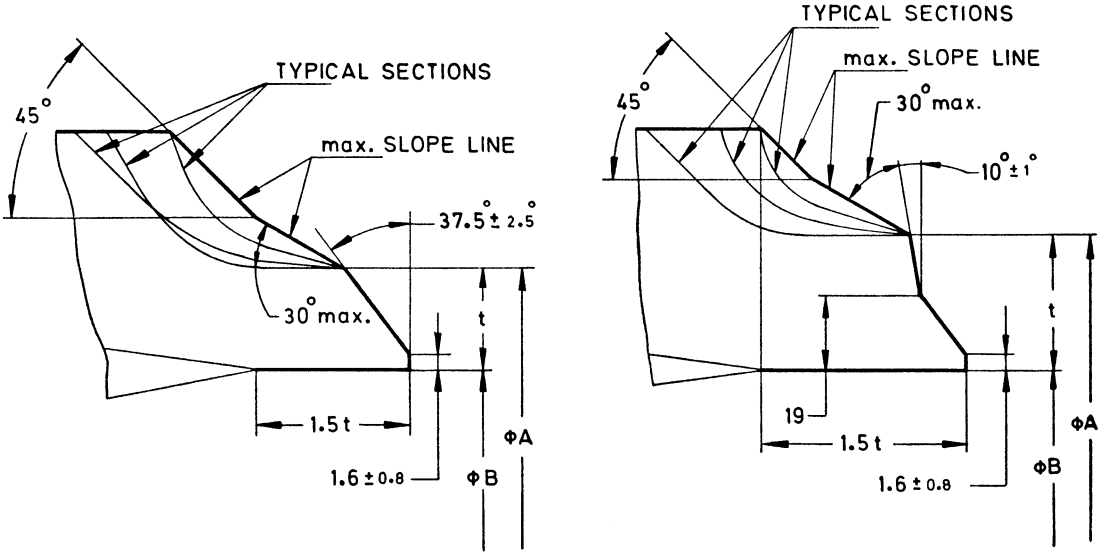


FIG. 7 BUTT WELDING ENDS

5.7 The seat bores shall be circular and their diameters shall not be less than the diameters at the end ports, but the lugs required to facilitate the fitting of seat rings shall not be considered for computing the area through seat. In the case of lift check valves, the bore area may be reduced by the minimum extent to permit the use of plug valve type disks, disks guided from below or special proprietory designs.

5.6 The area of flow way through and between the ports shall not be less than the area of circle of diameter equal to the diameter of the body and ports except that this area may be reduced by not more than 15 percent for lift check valves of special proprietory designs.

5.9 In case of swing check valves the body seat may be inclined to the vertical up to 5° approximately to facilitate proper closing and to prevent chatter.

5.10 All valves of nominal size DN50 and above shall have provision for tapping for drain/by-pass and where specified in the order, the valves shall be offered with drain tappings and by-bass arrangement in accordance with IS : 9625-1980 'Location of by-pass and drain connections for valves'.

6. Cover

6.1 The minimum wall thickness of cover at any point shall not be less than the values specified in Table 1, and the flange on cover and the corresponding flange on body shall be sufficiently thick to provide a leak-proof joint when the valve is operated continuously under the maximum working pressure.

6.2 The cover and corresponding flange on body shall be circular in shape, except for valves of all classes below 80 mm, they may be square or rectangular.

7. Body to Cover Joint

7.1 The body to cover joint shall be male and female, tongue and groove, or ring joint type, except for Class-150, which may be flat face.

7.2 The body to cover joint shall be secured by a minimum of four through stud bolts of not less than M10 size.

7.2.1 Total root cross-sectional area of stud bolts shall be sufficient to produce a stress not exceeding 632 kgf/cm^2 (62 MPa) at root of thread, by a pressure equal to nominal pressure rating acting on the area bounded by the effective outside periphery (for a ring joint, use pitch circle) of the gasket.

7.3 The cover and the corresponding flange of the body shall be spot-faced or back-faced and shall be machine finished on the joint side.

7.4 The body to cover joint gasket may be compressed asbestos fibre, spiral wound gasket or soft iron depending on the pressure rating of the valve or as specified by the purchaser.

8. Body Seat

8.1 Austenitic stainless steel valves and valves with hard faced seats may have body seat integral or directly deposited on the body. The austenitic or hard facing seat material deposit on body shall have a minimum thickness of 1.6 mm in the finished condition.

8.1.1 The body seat rings shall be of renewable type. The seat rings shall be either screwed in or rolled in or welded in unless one particular method is specified by purchaser and shall be either shoulder seated or bottom seated. Separate seat ring shall be furnished in other cases. Threaded rings shall be designed to facilitate removal. Body seat rings shall be so fitted as to avoid their becoming loose in service. The seat ring faces shall be finished smooth. The edges of the seating surface shall be chamfered to prevent scoring of disk.

8.1.2 Tack welding may be employed to prevent loosening. The use of sealing medium on threads is not permissible.

8.2 The hardness of seat rings in case of 13 percent Cr material shall be 250 HB minimum. In other cases, the hardness shall be as per manufacturer's standard.

9. Disk, Piston or Ball

9.1 *Swing Check* — The disks shall be renewable and shall have a flat seating face, finished smooth. The disks shall be secured to the hinge by a nut so as to allow for the self seating of the disk on the body seat.

9.2 *Lift Check* — Disks may be flat, spherical, radiused, bevelled, piston and dashpot type or of proprietory design. Provisions shall be made for guiding the disk. Where disks are of two piece construction, the design shall be such that the components cannot become detached in service.

9.3 The disks may have integral faces or may be fitted with separate facing rings firmly secured to the disk. These rings shall be rolled in, screwed or welded on. Directly deposited facings shall have a minimum thickness of 1.6 mm.

9.4 The hardness of seating surface shall be minimum 300 HB in case of 13 percent Cr material. In other cases, the hardness shall be as per manufacturer's standard.

9.5 In case of piston type disk, the piston may be a hollow cylinder which will fit into a guide so as to make an effective dashpot and for this purpose shall be provided with a bleed hole of proper size near the seating disk or in the piston guide.

9.6 In horizontal pattern valves, the ball shall be constrained in the guide so that a cushioning effect is obtained at the top end of the travel.

9.7 *Piston and Ball Guides* — Piston and horizontal pattern ball type check valves shall be provided with a removable guide for the piston or ball through out its entire travel. If the guide is independent of the cover the upper part of the guide shall be closed and guide shall be locked in position between the cover flange of the body and the cover. The top of the guide shall be provided with means to facilitate removal. The lower part of the guide whether integral with or independent of the cover, shall be a hallow cylinder or cage to accommodate the piston or ball, permitting it to travel upwards for a sufficient distance to provide adequate flow under the piston or ball when in the highest position.

9.7.1 Vertical or horizontal pattern ball type check valves shall be provided with guides that may be integral with the seat, with a grid that limits the travel of the ball but allows adequate flow when the ball is in fully open position.

10. Hinge and Hinge Pin (Swing Type) and Spindle Support Cage (Disc Type)

10.1 A hinge and hinge pin shall be provided as shown in Fig. 1 and mounted in the body so as to permit full movement of the disk.

10.2 A cage shall be provided complete with bearing bush to guide the disk spindle as shown in Fig. 6.

10.3 Hinge pin plug where fitted, shall be suitably secured to prevent loosening in service.

11. Special Requirements

11.1 Renewable facings of body seat or of disk of a special metallic or non-metallic material may be provided at the request of the purchaser. The effective operating temperature range of these valves will be limited by the service temperature of seating material.

11.1.1 *Soft seal ring* — A soft seal ring can be fitted in either the body seat or the disk seat as specified by the purchaser. The ring shall be designed to give a full metal to metal seat if the soft seal is inoperative or removed. Any retaining ring in the disk shall be of the same material as the disk but any fixing screw shall be of 18-8 Gr-Ni steel.

The seal ring shall be designed to withstand a minimum of 2 000 cycles of operating in dry atmospheric conditions, there shall be no evidence of damage or cold flow as revealed by spreading over the metal seat.

The effective operating temperature range of soft seal valves shall be limited by the service temperature of the seal material. Soft seal shall be of the manufacturers standard material for the duties specified.

11.2 *Outside Attachment* — In swing check valves, the hinge pin may be extended through the body of the valve and an outside lever with adjustable weights, damping device, fusible link or locking device, etc, to control the movement of the disk, can be provided if specified in the purchase order and if the design permits.

11.3 *Loading Spring* — Springs may be provided to achieve positive closure when there is a low differential pressure or when working fluid is highly viscous. Spring material shall not be inferior to the trim material.

12. Fasteners — The dimensions of body to cover joint fasteners shall be as per.

For temperatures up to 450°C, the body to cover, stud bolts and nuts may be of carbon steel having minimum tensile strength 415 N/mm^2.

For temperatures higher than 450°C, stud bolts shall be of alloy steel (1 percent chromium-molybdenum steel) and nuts shall be of carbon or alloy steel of different grade. For stud bolts less than 12 mm size, alloy steel nuts shall be used.

13. By-pass and Drain Connection — A by-pass or drain connection shall not be furnished unless specified in the purchase order.

The by-pass valve shall be a globe valve, O/S and Y, rising stem of at least of the same rating as the main valve. The size and location of the by-pass arrangement shall be as specified in IS : 9625-1980 'Locations of by-pass and drain connections for valves'.

14. Material — The materials shall be as agreed to between purchaser and manufacturer.

15. Body Cover Gasket — Free chlorides in compressed asbestos fibre material when used with low alloy or austenitic steel may cause stress corrosion cracking in the flange. The alternative gasket material should be considered.

16. Pressure Test — Each valve shall be pressure tested in accordance with first revision of IS : 6157-1981 'Valves inspection and test (*first revision*)'.

17. Marking — Marking shall be as specified in IS : 9866-1981 'Marking system for valves'.

17.1 *ISI Certification Marking* — Details available with the Indian Standards Institution.

18. Test Certificates — When specified by the purchaser, the manufacturer shall issue a test certificate conforming that the valves have been tested in accordance with this standard and stating the actual pressures and medium used in the test.

19. Inspection — If inspection is required, this shall be stated in the enquiry and order. The purchaser or his authorised representative shall have access to the manufacturer's works at all reasonable times to inspect assembled valves according to his order.

20. Preparation for Despatch — The valves shall be complete in all respects when shipped. Each valve shall be drained, cleaned, prepared and suitably protected (painting of finished valves shall be at the option of the manufacturer unless specified by the purchaser) for despatch in such a way so as to minimise the possibility of damage and deterioration during transit and storage. The machined surfaces shall be coated with easily removable rust preventive. The austenitic steel valves shall not be painted.

All valves disks shall be in closed position when despatched. The body ends shall be suitably sealed to prevent ingress of foreign matter during transit and storage.

21. The information to be supplied by the purchaser along with enquiry or order:

a) Type of valve required that is whether swing or lift (straight or angle) for horizontal or vertical use.

b) Class designation and nominal diameter (DN) of the valve.

c) End connections:
    i) If flanged ends are required, state type of facing required.
    ii) If butt-welding ends are required, state particulars of the pipe or wall thickness and outside diameter of the pipe.
d) The shell material and the trim material.
e) Whether a loading spring is required.
f) State if any of the following is required:
    i) By-pass arrangement
    ii) Drain connections
    iii) Outside attachment or damping device
    iv) Any additional markings
    v) Test certificates
    vi) Whether soft seals are required, if so, whether these are required to be in disk seats or body seats.

22. Guarantee — The manufacturer shall by acceptance of purchaser's order, guarantee the material, the design and the operation of the valves covered by the order to the extent that, if any defect or defects attributable to faulty workmanship, design or material are found in the valves, within a period of one year after they are placed in regular service or 18 months from the date of receipt of the valves (whichever is less), the manufacturer will furnish free of charge at the original point of delivery, any part or parts thereof that prove defective, provided the valves have not been misused or abused and have been installed in service for which they were recommended. If any valve is found to be defective prior to placement in service, the same shall be replaced by the manufacturer free of cost.

EXPLANATORY NOTE

This standard makes reference to the following standards:

IS : 1364-1967	Precision and semi-precision hexagon bolts, screws, nuts and lock nuts (diameter range 6 to 39 mm) (*first revision*)
IS : 1570-1971	Schedules for wrought steels for general engineering purposes
IS : 2004-1978	Carbon steel forgings for general engineering purposes (*second revision*)
IS : 2611-1964	Carbon chromium molybdenum steel forgings for high temperature service
IS : 2856-1979	Carbon steel castings for pressure containing parts suitable for high temperature service (fusion welding quality) (*second revision*)
IS : 3038-1974	Alloy steel castings for pressure containing parts suitable for high temperature service (*first revision*)
IS : 3444-1978	Corrosion resistant alloy steel and nickel based castings for general applications (*first revision*)
IS : 4218-	ISO metric screw threads
IS : 6157-1981	Valve inspection and test (*first revision*)
IS : 6392-1971	Steel pipe flanges
IS : 6603-1972	Stainless steel bars and flats
IS : 9625-1980	Location of by-pass and drain connections for valves.

In the preparation of this standard assistance has been drawn from BS 1868-1975 'Steel check valves (flanged and butt-welding ends) for the petroleum, petrochemical and allied industries issued by the British Standards Institution.

This edition 1.1 incorporates Amendment No. 1 (May 1986). Side bar indicates modification of the text as the result of incorporation of the amendment.